

**Excerpt from *Action Plan for Osteoporosis* by Kerri Winters-Stone, PhD**  
<http://www.humankinetics.com/products/showproduct.cfm?isbn=0736054820>

*Action Plan for Osteoporosis*  
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Paperback • 208 Pages  
ISBN 0-7360-5482-0  
\$17.95 (\$23.95 Cdn)

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### **Resistance Exercise and Bone Health** **From Chapter 4: Laying a Foundation for Bone Health through Exercise**

Resistance training, also called strength training, can have a positive effect on bone because the strong muscle contractions required to lift, push, or pull a heavy weight place stress on the bone. Muscles are attached to bones by tendons, a type of connective tissue, so the force generated by a contracting muscle is in turn felt by the attached bone. When bone feels a force upon it time and time again (as happens in regular exercise training), it responds by increasing bone mass so as to become stronger and better tolerate the strong muscle contractions. Exercise studies have used several different means of applying resistance to the skeleton, including resistance machines, free weights such as dumbbells and barbells, weighted vests for the lower body, and elastic tubing or bands. Studies also used varying amounts and intensities of exercise. Generally, resistance exercise using any means of applying resistance of sufficient intensity successfully maintains or slightly improves hip and spine bone mass in most women (Wolff et al. 1999). In women with osteoporosis, moderate resistance exercise has been directed at fall prevention and has been shown to prevent falls.

By strengthening muscles that are important for fall prevention, resistance training also strengthens the muscles that are important for good physical function in performing tasks that require some strength (e.g., lifting groceries or grandchildren, rising from a chair, climbing stairs). Strong leg muscles can also contribute to better balance and locomotion that reduce the risk of falls. When someone starts to fall, having strong muscles makes it more likely they can stop their fall by quickly putting out a leg to counteract the downward movement. There is also some evidence that resistance exercise can help lower blood pressure, improve blood lipids (cholesterol and triglycerides), and aid in weight reduction.

Resistance exercise often conjures up images of big, bulky muscles and overcrowded gymnasiums. These stereotyped images can turn people off to the

notion of lifting weights. However, resistance training can be done anywhere with minimal equipment (for some exercises, no equipment is required) and can even be fun. When I was a graduate student, I recruited and trained 40 middle-aged women to do resistance and impact exercise three times a week for a year. Only a few of the women had ever lifted weights before and most were intimidated and skeptical of the program, but we plodded awkwardly through the first weeks with a few grunts and groans, and after a month the women were hooked! They started feeling better and noticing the effects that having strong muscles had in their daily lives. One woman remarked that she could downhill ski better than she had in 20 years after doing our program regularly. Another found it easier to care for her husband, who had recently developed multiple sclerosis. And we did all of these exercises in a windowless, open room with very little equipment. I also led similar exercise classes for other studies in older and elderly women. They, too, were skeptical but after a month or two started noticing the difference. Women could garden with more ease and less stiffness and were able to hike the local mountains. Our elderly participants could take the stairs and get out of chairs without using their arms—tasks they swore they could never do. Most impressive of all is that many of these women have continued doing our exercise program, some for more than eight years now! They do the programs at home or in local fitness classes, but they swear they will never stop because they know the resistance exercise makes them feel better, benefits their bones, and lowers their risk of falling.

Resistance exercise is now recommended by the American College of Sports Medicine for all individuals, especially older adults who may have had some bone and muscle loss due to age. Following proper guidelines, resistance exercise has been safely performed even in 90-year-olds! Resistance exercise may be a new endeavor for you, but it could make a real difference in your life, so give it a try!